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August 31, 2004

Filed Electronically

Marlene Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: *Ex Parte Presentation*
ET Docket No. 00-258; IB Docket No. 99-81

Dear Ms. Dortch:

The Commission is considering auctioning the 1995-2000 MHz block, which has been reallocated from the Mobile Satellite Service ("MSS") to the Advanced Wireless Service ("AWS"), to permit full-power broadband PCS operations in that so-called "H Block." TerreStar Networks, Inc. ("TerreStar"), the proposed assignee of an MSS authorization that has contracted with Space Systems/Loral ("Loral") for a satellite that will operate in part of the spectrum in, *inter alia*, the 2000-2020 MHz band, has raised concerns about the significant interference issues that could exist between H Block PCS operations and MSS operations in the adjacent MSS band.

To facilitate the Commission's consideration of these issues, TerreStar commissioned the attached engineering study performed by Dr. Santanu Dutta, Vice President for Systems Engineering of Mobile Satellite Ventures ("MSV"), TerreStar's corporate parent. *See* Attachment 1. As Dr. Dutta's analysis demonstrates, the potential for broadband PCS operations at 2000 MHz to cause significant interference to MSS operations in a directly adjacent band is significant and should be taken into consideration in determining whether and how to use the H Block. Dr. Dutta's analysis confirms that the satellite currently being built by Loral for TerreStar's North American MSS service may be susceptible to interference. Loral has confirmed the filter specification used in Dr. Dutta's analysis. *See* Attachment 2.

In reallocating the spectrum that currently constitutes the H Block from MSS to AWS, the Commission stated that "new operations in the 1990-2000 MHz band will need to take into account these adjacent band operations when developing and deploying new services and equipment" and that "licensees and operators in this band should take measures both to ensure that their operations are protected from MSS/ATC operations and will protect MSS and ATC operations from interference."[1] As the Commission continues to consider how it should permit

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[1] *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including* (continued...)

use of the H Block, TerreStar urges the Commission to focus carefully on issues of MSS-PCS interference.

TerreStar is working hard to launch its service in a spectrum environment made more challenging by the Commission's reallocation of nearly half of MSS spectrum just 18 months ago. Losing further spectrum because of interference concerns could severely damage our industry. As an expert for the Cellular Telecommunications & Internet Association recently wrote to the Commission: "It is hard to imagine any scenario in which H-block operations do not impair or limit future MSS operations. In essence, if the H-block is built out, the MSS industry will have to accept the loss of a few MHz of spectrum as an implicit guardband."[2] Given the significantly smaller amount of spectrum to which each MSS licensee now has access in the 2000-2020 MHz band to launch a nationwide service, this type of "implicit guardband" is far more than any MSS licensee can afford.

Regulatory certainty in the areas of spectrum management and interference protection is essential for Loral to construct TerreStar's satellite in a predictable and efficient manner and for TerreStar to launch the effective, robust and successful service it has planned. Our "base stations" are far out of our reach the instant they are launched, and the Commission's milestone process makes it impossible for a satellite operator to simply delay a launch to accommodate a changed technical requirement.

We urge the Commission to continue to take the interference concerns discussed on the attached study and letter from Loral into account as it considers the use of the H Block. Please direct any questions concerning this matter to the undersigned.

Respectfully submitted,

Jonathan D. Blake
Kurt Wimmer

Counsel for TerreStar Networks Inc.

Third Generation Wireless Systems, FCC 03-16, ET Docket 00-258 and IB Docket 99-81, ¶ 51 (Feb. 10, 2003).

[2] Charles L. Jackson, *Conflicts between Operations on the Proposed H-Block and Existing PCS Receivers,* August 2004, at 7, *attached to* Letter from Paul Garnett, CTIA, to Marlene H. Dortch, FCC, August 18, 2004.

ATTACHMENT 1

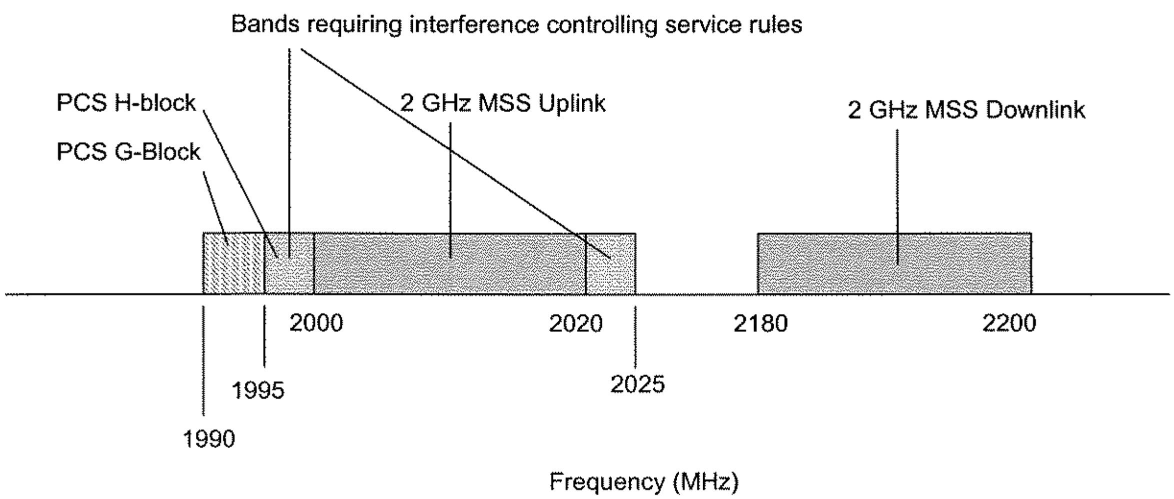
MSV
Mobile Satellite Ventures

Potential Interference Issues between PCS 1900 and 2 GHz MSS

1.0 Background

The FCC has allocated the 2000 – 2020 MHz to the uplink and 2180 – 2200 MHz to the downlink for MSS in the 2 GHz band. The FCC reallocated 5 MHz of spectrum immediately adjacent to the 2000 – 2020 MHz band, comprising the so-called PCS H-block, from MSS to Advanced Wireless Services. In reallocating that spectrum, the FCC stated that "new operations in the 1990-2000 MHz band will need to take into account these adjacent band operations when developing and deploying new services and equipment" and that "licensees and operators in this band should take measures both to ensure that their operations are protected from MSS/ATC operations and will protect MSS and ATC operations from interference."[1] This spectrum plan is illustrated in Figure 1.

Figure 1 Spectral Allocations around the 2 GHz MSS band (S-band)



An interest has been expressed by some PCS stakeholders in using the AWS allocation in the H Block for broadband PCS. This paper is a contribution to the topic of how that use may be achieved while achieving the interference protection mandated by the FCC in allocating H Block spectrum to AWS.

[1] *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, FCC 03-16, ET Docket 00-258 and IB Docket 99-81, ¶ 51 (Feb. 10, 2003).

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The following interference mechanisms are possible between PCS and 2 GHz MSS, noting that the PCS G- and H-blocks are *downlinks* for the PCS service:

1. Out-of-band (OOB) emissions from PCS base station (BTS) carriers into the 2 GHz MSS uplink.
2. Satellite receiver overload owing to out-of-band transmissions from PCS BTS carriers.

In addition, there is the potential for similar interference (as described in 1 and 2 above) between PCS BTS transmitters and S-band ATC BTS receivers. However, this paper focuses only on interference mechanisms 1 to 2, as described above.

2.0 Interference Analyses

2.1 Satellite Uplink Receiver Overload by Out-Of-Band Transmissions

The overload interference situation existing between PCS downlink to the S-band MSS uplink is described by the following model. 10,000 BTS carriers are considered as that is the approximate threshold of a commercially attractive service.

Table 1 Overload Interference Model from PCS 1900 BTS Transmitters to S-band MSS Uplink Satellite Receivers

Number of BTS carriers	10,000	
BTS EIRP per sector	30	dBW
Overhead gain suppression to the satellite	15	dB
Net EIRP towards satellite	55	dBW
EIRP of 1 satellite CDMA 1x MT[2]	-12	dBW
Dynamic range requirement	67	dB

The S-band satellites being built by TerreStar have a frequency selectivity in the uplink receive path that offers 30 dB rejection at 5.25 MHz offset from the band edge. The net dynamic range of typical satellite LNA's is approximately 40 dB [information provided by Space Systems/Loral]. However, a significant part of this dynamic range is required to accommodate the MSS's own signals, which are multicarrier and, in the case of

[2] Maximum power of CDMA MT is -7 dBW. MSV satellite link budgets assume an average fading loss of 5 dB. Hence the average power of one satellite CDMA MT is -7 – 5 = -12 dBW

TerreStar's system, employ a CDMA 1x based air interface, which requires quasi-linear channels.

If a guard band of approximately 5 MHz is allowed, then the dynamic range requirement is reduced (owing to filtering) from 67 dB to 67 – 30 = 37 dB, which will still use up half the dynamic range of the LNA.

Conclusions

> **Given TerreStar's current design for its S-band satellites, which assume a 5 MHz guard band on either side of the 2000 – 2020 MHz band, 10,000 BTS carriers will cause unacceptably high levels of overload interference to its satellite receiver front ends unless the above guard bands are observed.**

2.2 Out-of-band (OOB) Interference from PCS BTS to S-band Satellite Uplink Receiver

The PCS specifications for CDMA2000 Band Class-1[3] stipulate that the OOB emission shall be -13 dBm/MHz at a frequency offset of 2.25 MHz from the center frequency of the carrier. This means that, in order to achieve the above power spectral density (psd), the BTS transmit carrier frequency would have to leave a guard band of 1.625 MHz[4] from the lower edge of the 2000 - 2020 MHz band. Clearly, less guard band could be left if additional BTS filtering were performed over and above the requirements of the specification in footnote 4. Whatever the guard band, however, there will be some number of BTS carriers whose collective OOB interference will be harmful to the satellite system. For the present, we assume that, with some appropriate (BTS filtering dependent) guard band, the BTS achieves an OOB psd of 13 dBM/MHz or lower at all frequencies inside the 2000 – 2025 MHz band; we then calculate the maximum number of BTS carriers based on the above assumption; if the psd could be lowered further, that would translate directly to a higher number of BTS carriers.

For an S-band GEO satellite with G/T = 19 dB/K (as per TerreStar's current Application), the transmit EIRP of the mobile is approximately -12 dBW, or 18 dBm. This assumes CDMA 1x as the air interface, so the mobile's power spectral density is approx. 18 – 10log(1.2288) = 17.1 dBm/MHz.

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[3] TIA-97-E BTS spec. Although this analysis assumes deployment of CDMA2000, similar characteristics would be observed in a GSM deployment.

[4] The guard band is measured from the nominal edge of the PCS signal to 2000 MHz. As the 2.25 MHz offset requirement is with respect to the carrier frequency, the guard band is 2.25 – (1.25/2) = 1.625 MHz.

A 6% increase in noise floor ($\Delta T/T$) is accepted industry-wide as the trigger for inter-system coordination. Invoking this rule, the allowed noise floor contributed by all BTS carriers referred to the ground,[5] will be 17.1 + 10log(6/100) = 4.9 dBm/MHz

In addition to reduction of the OOB emissions through filtering and/or transmitter linearization, BTS radiations reaching the satellite will be further reduced by the overhead gain suppression of the BTS antennas. Typically 15 to 20 dB of overhead gain suppression may be booked for typical commercial PCS systems.

From the above, the number of PCS BTS carriers allowed with -13 dBm/MHz OOB spectral emission in the 2000 – 2020 MHz band would be 4.9 – (-13) + 15 = 32.9 dB or 1,950 in number (assuming 15 dB overhead gain suppression).

Conclusions

> **If, within the 2 GHz MSS uplink band, the BTS OOB psd is maintained below the -13 dBm/MHz, as required by PCS BTS specifications for CDMA 1x Band Class 1, then up to 1950 BTS carriers will create a $\Delta T/T$ at the satellite of no greater than 6%.**
>
> **Without additional filtering/linearization, the BTS carrier frequency will need to leave a guard band of 2.25 MHz with respect to the lower edge (2000 MHz) of the MSS uplink band to keep the OOB psd below the threshold of -13 dBm/MHz.**
>
> **Reducing the 2.25 MHz guard band, and/or increasing the number of BTS carriers, will require achieving a lower OOB emission mask than stipulated by CDMA 1x Band Class 1 specification.**

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[5] "Referred to the ground" means that calculations regarding relative signal and interference levels are performed by comparing their transmit power levels on the ground, not at the satellite receiver input. This is a valid approach as the same propagation loss applies to both the desired signal and the interference.

ATTACHMENT 2

SPACE SYSTEMS
LORAL
3825 Fabian Way M/S
Palo Alto, California 94303-4604

August 18, 2004

To Whom It May Concern:

This is to attest that Space Systems/Loral's current design for the S-band Geo satellite for TerreStar offers the following receive out-of-band rejection characteristics as stated in paragraph 3.12.2 of the satellite specification:

> For a passband of 2000 to 2020 MHz, the rejection at 1994.75 MHz and 2025.25 MHz is at least 30 dB relative to the passband.

It is also true that the first LNA in the receive chain has a dynamic range of approximately 40 dB.

Sincerely,

Kirby Chung
Program Manager, Terrestar/Celsat